# Approaches to medication history taking in different hospital settings: A scoping review

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**Purpose:** A comprehensive medication history can contribute to safe therapy. Many approaches aiming to improve medication history taking require significant human resources. To design an efficient process that delivers high-quality medication histories, the individual requirements and resources of a given setting need to be considered. We aimed to provide an overview of existing approaches to medication history taking and their performance in different settings to potentially support the selection of an appropriate procedure.

**Methods:** We searched 3 literature databases (PubMed/MEDLINE, CINAHL, PsycINFO) for publications on approaches to medication history taking and analyzed them with regard to their key components as well as the setting, patient population, assessed outcomes, and efficacy.

**Results:** In total, 65 publications were included and analyzed. The majority of the reported approaches relied on involvement of dedicated staff (n = 43), followed by process-oriented interventions (eg, checklists; n = 15) and information technology (IT)–guided interventions (n = 11). A mean (SD) of 6 (2.9) outcomes were described in each study. Medication discrepancies were reported in 89% of all studies, yet about 75 different descriptions of this outcome were used, making it difficult to compare study results. Only 11 studies applied a sample size calculation and statistical tests. Of those, 10 reported a positive effect of their respective intervention on the quality of medication histories.

**Conclusion:** Most approaches focused on pharmacy staff, which are associated with considerable cost and resources. Therefore, IT-based approaches and patient engagement should be investigated as cost-effective alternatives and tested for superiority in the same setting. Reporting guidelines and standardized methodology are needed to improve the comparability of such studies.

**Keywords:** continuity of care, medication errors, medication history, patient admission, quality of healthcare, review

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Clarity about a patient's current drug therapy is critical to ensure continuity of drug therapy, especially during transitions between primary care and inpatient settings where the responsible healthcare team typically changes. Therefore, taking a medication history is important to obtain a complete overview of a patient's current therapy.[1] Medication histories in routine care are often inaccurate,[2-5] leading to medication discrepancies (MDs) between a patient's preadmission medications and the medications prescribed at hospital admission.[6,7] Unintentional MDs occur for more than half of patients, with the most common discrepancy being omission. It has been estimated that one-third of unintentional MDs are potentially harmful to the patient or can worsen clinical outcomes.[6]

Medication history taking at the hospital consists of several steps. First, information has to be gathered from

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various sources: automated transmission and active acquisition of information by staff contribute to this step, and both can be facilitated with appropriate tools. The acquired information then has to be aggregated and verified, resulting in a comprehensive medication history that should be documented in a format ready to use for further applications such as admission medication orders. Additional steps such as quality control of the final list, eg, through second-source verification, and adequate staff training on each task ensure a baseline level of standardization. To choose the most efficient (ie, highest possible quality with the lowest possible expenditure of resources) approach for medication history taking, available resources, infrastructure, and features of the process have to be considered. The involvement of pharmacy staff has already been studied, with these staff shown to deliver medication histories of high quality,[8,9] but this approach requires significant staff resources. Training of physicians, access to data from community pharmacies, and enhanced collaboration among patients, pharmacists, and physicians have significantly reduced the frequency of errors in medication history taking.[1] Yet, the efficiency of these approaches has not been evaluated with regard to specific hospital settings or patient groups. Hence, a review of best practices for medication history taking that considers the practice setting and economic impact is needed. A preliminary search of MEDLINE, the Cochrane Database of Systematic Reviews, and JBI Evidence Synthesis was conducted and no current or in-progress reviews on the topic were identified.

## KEY POINTS

- Most studies investigating medication history taking have focused on pharmacy staff; however, because this approach usually requires significant resources, more cost-effective approaches should be explored.
- The great variability in study methodology, definitions, and reported outcomes makes comparisons of different approaches and conclusions about superiority difficult.
- To improve the transferability and comparability of approaches to medication history taking in different hospital settings, reporting guidelines should be established and standardized terminology should be defined for future research in this area.

## Objectives

The aim of this project was to provide a systematic overview of studies assessing the quality of medication history taking programs and to group them by key components (information technology [IT], dedicated staff, process orientation), setting, patient population, assessed outcomes, and efficacy. This structured overview should help to identify the most suitable and efficient approaches for a given setting and patient population.

## Methods

This review was conducted in accordance with the JBI methodology for scoping reviews and the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) checklist.[10-12] The protocol was registered at Open Science Framework on June 2, 2022 (registration doi: 10.17605/OSF.IO/VM9S3).

**Search strategy, study inclusion, and data extraction.** After an initial search in MEDLINE, a search strategy was developed and adapted for CINAHL and PsycINFO. The search was run in March 2022 and rerun in May 2023. We included articles aiming to improve or assess the quality of medication history taking at hospital admission. All studies were independently screened by 3 reviewers and included or excluded based on the established eligibility criteria. Relevant data on participants, process, key components (IT, dedicated staff, process orientation), setting, patient population, assessed outcomes, and efficacy was extracted from all included studies. A quality assessment was carried out to obtain an impression of the overall data quality but had no impact on inclusion or exclusion. A description of the inclusion and extraction process is provided in eAppendices A to D.

**Data synthesis and analysis.** Studies were assigned to 3 main categories of approaches, leaning on a systematic review by Mueller et al,[9] that were modified to better fit our data, as well as 10 derived subcategories. On the basis of their primary focus, all included studies were assigned to the categories and derived subcategories to specify the approach precisely (eAppendix F). Additional components of the approaches were identified as well as setting and population characteristics. We identified 3 types of outcomes, ie, those relating to the quality of the medication history taking (eg, accuracy), those further specifying the quality-related outcome (eg, types of MDs), and outcomes that were only indirectly related to the quality of the medication history taking and described associated clinical outcomes or workflow characteristics (eg, adverse events or staff satisfaction). To compare the approaches more precisely, similar outcomes were clustered, eg, time-related results describing the time spent on medication history taking and related tasks (eAppendix G). In addition, studies that conducted a sample size calculation based on their primary outcome and applied statistical tests were extracted, used to assess effectiveness, and mapped to the steps of the medication history taking process. Data were analyzed and figures were created using R (R Foundation for Statistical Computing, Vienna, Austria; R version 4.3.1) and Microsoft Excel 2019 MSO (16.0.10394.20022) 32-Bit, Version 1808 (Microsoft Corporation, Redmond, WA).

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## Results

Of 2,320 articles identified in the first search in 2022 in 3 databases (excluding 737 duplicates), 296 articles were reviewed after title and abstract screening. Of these, 62 met the inclusion criteria. The second search in 2023 identified 3 additional studies, resulting in a total of 65 included articles reporting 65 studies. Of these, 43 were conducted in North America, 15 were conducted in Europe, and 7 were conducted in Australia. The publication years ranged between 1982 and 2023. Most studies were conducted at a single study site (58/65, 89%). Only 7 studies were multicentric, with 6 each being conducted at 2 sites[13-18] and 1 conducted at 5 sites.[19] Most studies followed a prospective design (51/65, 78%). The quality of 21 studies was good, 38 studies were of medium quality, and 6 studies were of poor quality (eAppendix E).

**Approaches and key components.** Of the 65 studies assessing medication history taking, 11 focused on IT-guided approaches[14,17,19-27], 43 focused on dedicated staff[15,16,18,19,21,28-65], and 15 focused on process-oriented approaches.[13,39,55,66-77] Four studies with complex interventions were allocated to more than one category.[19,21,39,55] IT-guided approaches relied on integrated applications or programs in 7 cases,[14,17,22,24-27] on devices in 3 cases,[19-21] and on both in one study.[23] Among the approaches focusing on dedicated staff, the majority engaged pharmacy staff (pharmacists, n = 16; pharmacy technicians, n = 22; pharmacy students/interns, n = 10), 7 included multiprofessional staff, 2 included nursing staff, and 1 involved physicians and advanced practitioners. Most studies in the process-oriented category investigated the effect of standardization on medication history taking (n = 12). Patient-based approaches were found in both the IT-guided and process-oriented categories: patients self-completed their medication history using a tool such as a tablet-based application[23] or self-administered questionnaires and forms.[39,55,73,77] The complete assignment of studies is shown in Figure 1, with a more detailed description in eAppendix F.

The majority of approaches consisted of multiple additional components, most commonly the use of a checklist, guideline, or form (72%), followed by supportive training (52%), mandatory consulting of at least 2 sources for compiling a medication history (45%), quality checks (28%), an IT component within the process (22%), and supervision by senior staff (20%). The distribution of these additional components in the 3 main categories is shown in Figure 2.

**Setting and patient population.** Of all the studies, 34 were conducted in emergency units,[13,15,16,18,19,21,23,28,29,31,33,37,38,41,44-49,52,54,56,57,59-61,66,68,72-74,76,77] 23 were conducted in regular wards,[13,14,17,20,22,24,26,32,34,40,43,50,51,55,61-63,66,67,69,70,72,75] 6 were conducted in intensive care facilities,[34,35,42,43,63,65] and 2 were conducted in preadmission clinics.[39,64] Some studies were conducted in more than one type of facility. For 5 studies, specific hospital settings were not mentioned or not defined (eg, hospital-wide studies).[25,30,53,58,71]

Most studies involved adult patients (≥18 years old); 5 focused on older patients (≥65 years old),[26,28,36,62,69] 2 focused on children,[43,74] and 1 addressed delirious or mechanically ventilated patients only.[35]

**Assessed outcomes.** Each study reported a mean (SD) of 6 (2.9) different outcomes, ranging between 1 and 14 outcomes in total (eAppendix G).

***Quality of medication history outcomes.*** A mean (SD) of 3 (1.8) outcomes per study were used to describe the quality of medication history taking (range, 1-13 outcomes). The quality-related outcomes were clustered into 4 main outcomes: (1) accuracy or correctness on the medication level or medication history level (reported in 23 studies, 35% of studies); (2) agreement between medication history lists (reported in 4 studies, 6%); (3) MDs on the medication level, medication history level, patient level, or overall (reported in 58 studies, 89%); and (4) the number of medications identified (reported in 23 studies, 35%). Five main groups of outcomes specified or classified quality-related outcomes, ie, clinical severity of errors, corrections of the medication history, MDs by type, MDs by drug class, and associated risk factors.

***Quality of the outcomes.*** For each main outcome, various outcome descriptions were used in the different studies, for a total of 158 different descriptions of quality outcomes (including outcomes that could not be summarized to a superordinate main outcome). For example, 75 different outcome descriptions were found for measurements of MDs. Differences in definitions were found in all main outcome groups. For instance, some studies defined MDs as only omissions, whereas other studies also included commissions and incorrect doses, frequencies, application forms, and strengths. Other studies considered every mismatch between 2 medication histories to be an MD without further specification. A similar variety in definitions was found for accuracy.

***Indirect outcomes.*** For outcomes not related to quality, 10 different main outcome groups were found, such as outcomes measuring healthcare utilization, allergy or immunization history, and workflow characteristics. For example, outcomes describing the time spent on medication history taking and subtasks were reported in 27 studies[13,19,20,23,24,28,30,36,37,40,44,45,47,48,51,52,55,58,59,61-63,67,69,70,74,75] (Figure 3). Subtasks included consultation of sources, interview (specified by type or by the professional group conducting it), preparation, reconciliation with admission orders, and verification (eg, second-source verification). Because of the different study interventions, the extent and nature of the data reported for time spent vary. Therefore, data for every single subtask were not available for all studies.

**Efficacy.** Of the 65 included studies, 11 were powered to detect significant effects and reported statistical tests. These studies were considered capable of measuring the

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**Figure 1.** The 65 studies that aimed to improve medication history taking at hospital admission were assigned to main categories: information technology (IT) guided (n = 11), dedicated staff (n = 43), and process oriented (n = 15), and derived subcategories: application (n = 8), device (n = 4), pharmacist (n = 16), pharmacy technician (n = 22), pharmacy student/intern (n = 10), nursing staff (n = 2), multiprofessional (n = 7), standardization (n = 12), training (n = 2), and other (n = 3). Heath et al[43] investigated physicians and advanced practitioners.

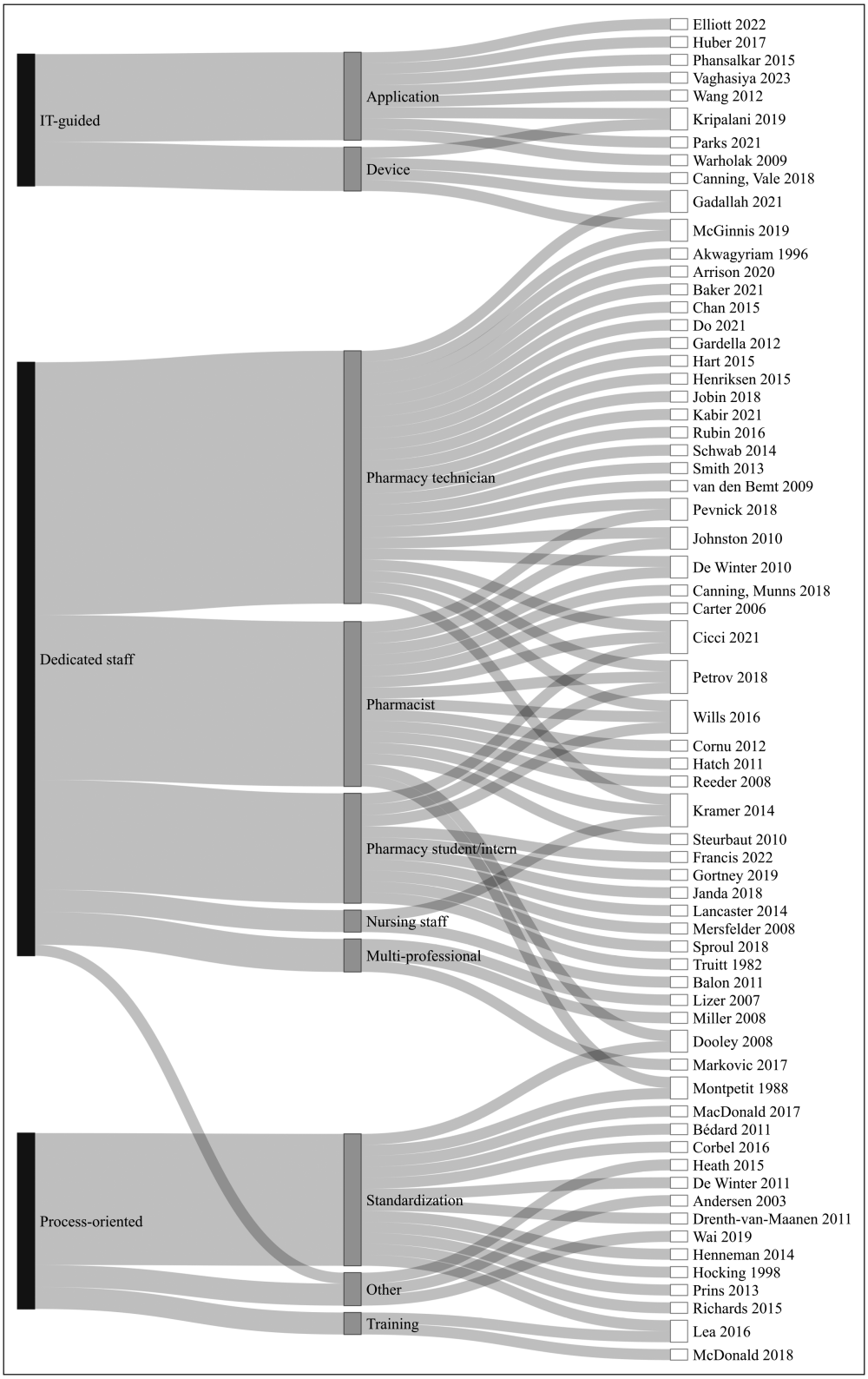


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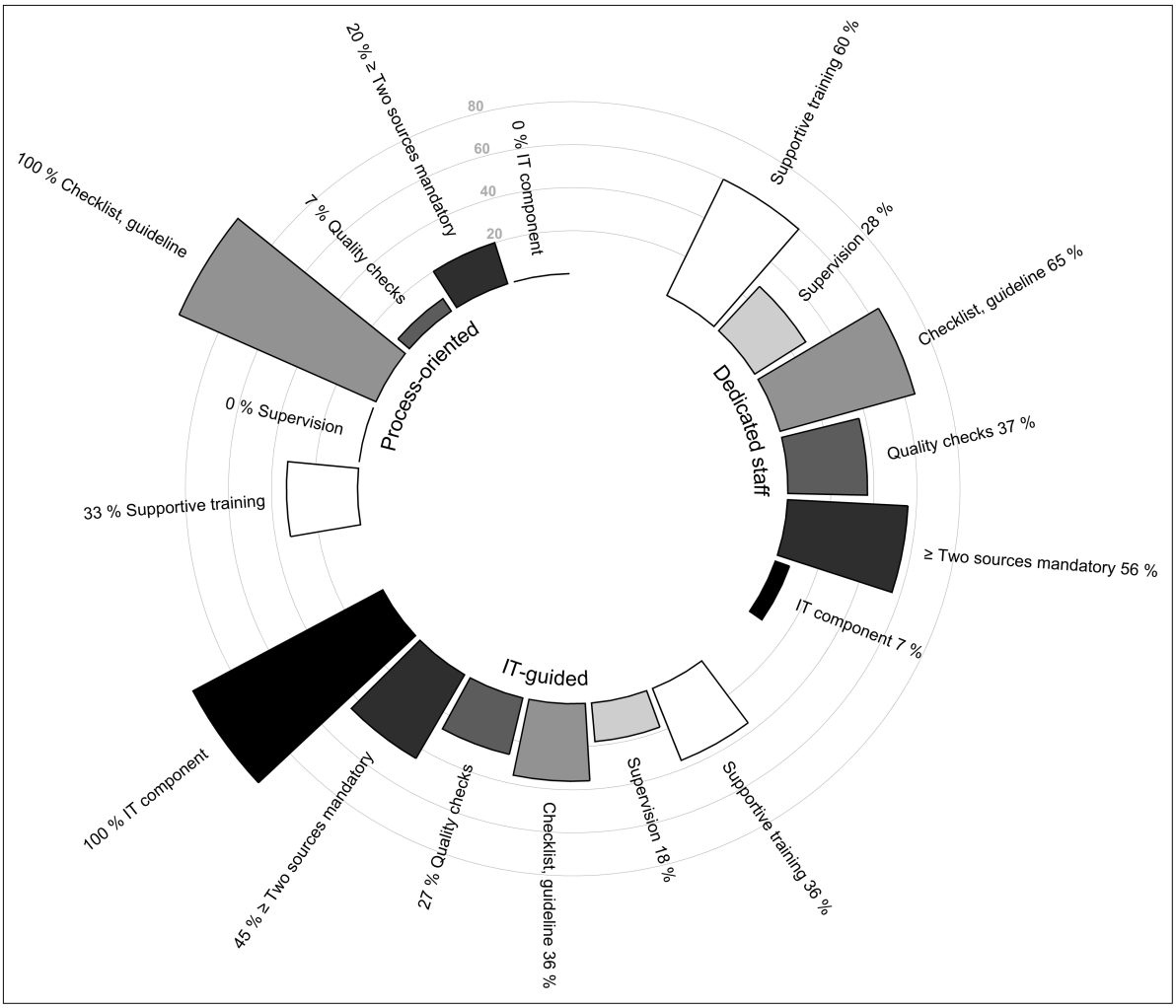
**Figure 2.** Key components from 65 intervention studies assessing the quality of medication histories taken at hospital admission, sorted by main category. IT indicates information technology.




effectiveness of a procedure of medication history taking, included in the subsequent overview of effectiveness, and mapped to the medication history process (Figure 4). With regard to their primary outcomes, 10 studies reported significantly higher medication history quality for the intervention group (Table 1), whereas one study showed no significant effect.

Of the studies with a positive effect, 7 were based on dedicated staff[21,38,41,49,57,61,64] of which 5 evaluated pharmacy technicians.[21,38,41,61,64] One study investigated medication histories taken by either pharmacy technicians or pharmacists,[57] whereas another compared nurses, pharmacy technicians, and pharmacists and found significantly better results for pharmacy staff.[49] All of these studies were conducted in an emergency department (ED) setting with the exception of one study that also included direct admissions (eg, by a general practitioner)[61] and one study that was conducted in a preoperative screening clinic.[64] Among the IT-guided approaches, a positive effect was shown for implementation of an electronic checklist[26] and for pharmacy technicians serving multiple EDs remotely.[21] A process-oriented intervention was able to improve medication history quality in the ED through the introduction of a standardized form.[68] On average, interventions with a positive effect, regardless of their categories, featured 5 additional components, most commonly supportive training (91%) and use of a checklist, guideline, or form. However, the study with no significant effect investigated a checklist and nonmandatory teaching.[72]

## Discussion

Numerous studies have examined strategies to improve medication history taking. This review shows that, while a variety of different approaches have been explored, the most common has been medication history taking by pharmacy staff, which regularly provide high-quality medication histories that are often better than those taken by physicians or nurses alone.[21,38,41,57] In comparison, IT-guided or primarily process-oriented approaches have not

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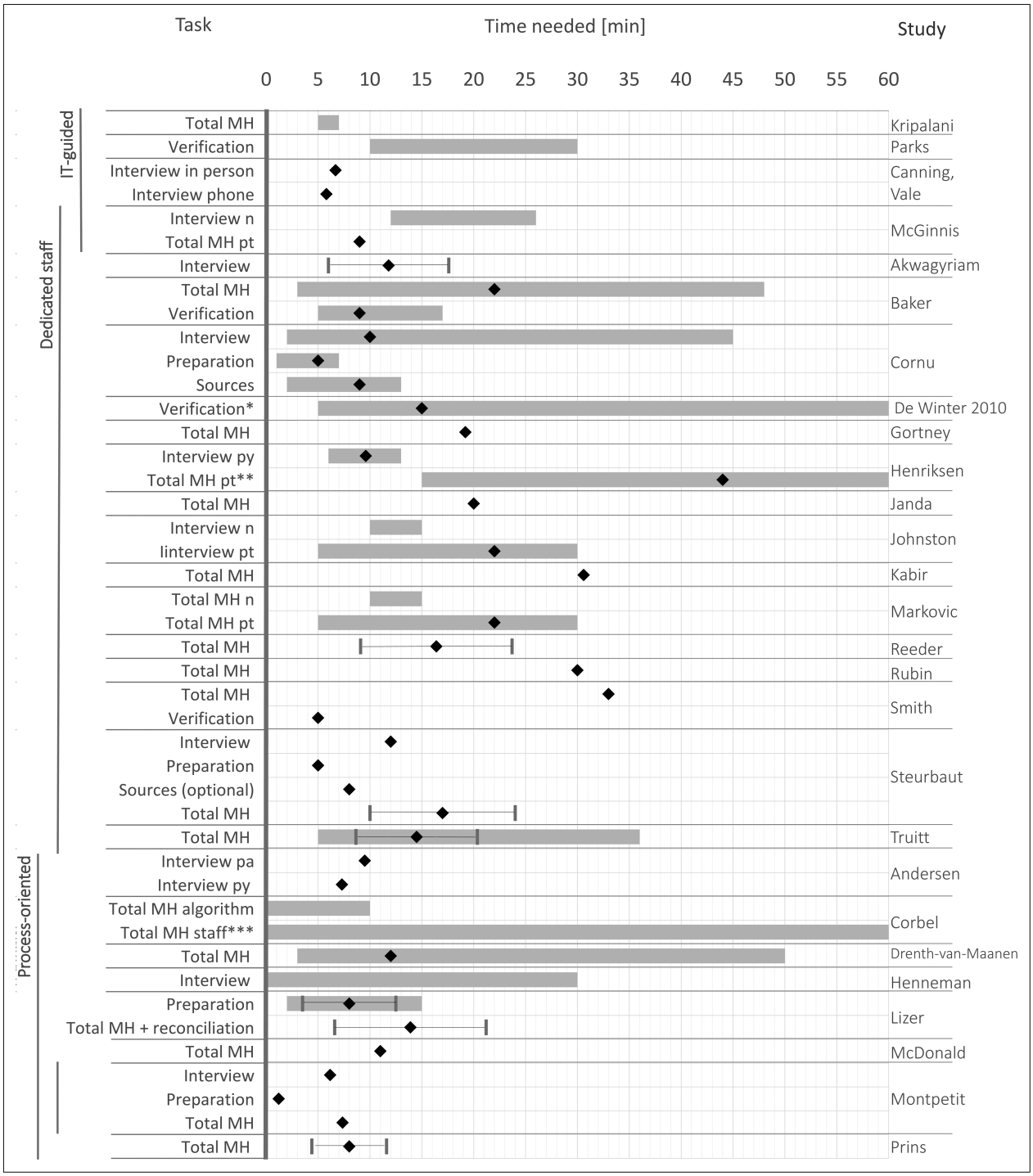


**Figure 3.** The time needed for medication history taking and related subtasks (consultation of sources, interview, preparation, reconciliation, verification) was reported in 34 studies. Because of the different study interventions, the type of reported data items varied. Diamonds, average time ± SD; gray bars, time range. MH indicates medication history; n, nursing staff; pa, pharmacist; pt, pharmacy technician; py, physician. *De Winter 2010: maximum time needed = 90 minutes.[37] **Henriksen 2015: maximum time needed = 150 minutes.[44] ***Corbel 2016: maximum time needed exceeds 1 week.[67]

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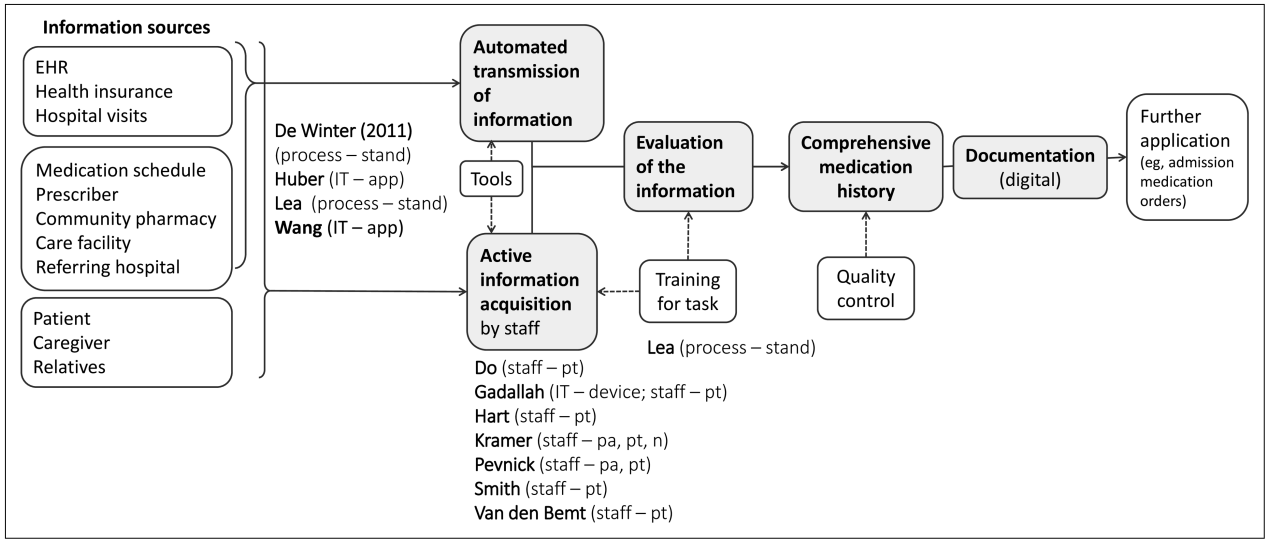


**Figure 4.** Steps of medication history taking and studies addressing them. App indicates application; EHR, electronic health record; IT, information technology; n, nursing staff; pa, pharmacist; pt, pharmacy technician; stand, standardization.

yet been extensively studied, as shown by the lower number of studies in these categories, indicating a research gap. The reported strategies combined multiple components and were most likely adapted to one specific setting, making each process unique to a certain extent.

Although MDs have been widely accepted as a quality outcome for the evaluation of medication history taking and medication reconciliation, the wording of this and other outcomes is inconsistent: even though the meaning might be similar or almost identical (eg, the number of preadmission medications and number of home medications), endpoints are subject to various denominations and alterations. The large number of outcomes found in the included studies illustrates this lack of standardized terminology. Variations in definitions (eg, which kinds of errors are considered an MD) and differing methods to obtain outcome parameters complicate direct comparisons and render them less meaningful.

Of all 65 studies included in this review, only 11 were considered suitable for comparison of efficiency based on our preestablished criteria. The lack of thorough and robust studies in this field impedes further evaluations or meta-analyses. It would be interesting to analyze successful approaches with regard to common elements and factors influencing effectiveness to design more efficient procedures. However, we were unable to conduct such analyses due to the aforementioned lack of statistical evidence. In addition, it remains difficult to determine the clinical relevance of accurate medication histories for patients. Studying the actual clinical effect of medication history taking in isolation is difficult due to the many factors influencing clinical outcomes in a real-world setting and the fact that medication history taking occurs early in the patient journey. An accurate medication history by itself might have only an indirect clinical impact: Unintentional MDs in admission orders are potentially harmful to the patient in the later course of care,[6] and it has been shown that most of these errors originate from errors in medication history taking.[7,78] Accurate medication histories are the basis of clinical decisions at the hospital and other more complex interventions such as discharge management, medication reconciliation, and medication review, which have an impact on clinical outcomes.[36,79,80] Therefore, medication histories can be considered an important contributor to safe therapy and should be of high quality.

This review met our main objectives, as it provides an overview of the available data on medication history taking interventions. However, it remains unclear which approaches are most suitable for a specific setting. Because of the complexity of the process of medication history taking, it is not yet possible to determine the importance of certain components for the individual steps based on the available data. As shown in the results, components such as training and standardization appear to be a prerequisite for a positive effect but are insufficient to achieve significant improvements.

**Recommendations and implications.** To address the heterogeneity in study methodology and difficulty in determining effectiveness, we suggest that reporting guidelines for studies investigating medication history taking be established: first, a detailed description of the standard care process is necessary to identify the step that is primarily being targeted by the intervention. For both standard care and new processes, such a description should include (1) the information sources and their availability (eg, automated transmission or active acquisition through staff); (2) the staff (the professional group(s) involved, their tasks and responsibilities within the process, and



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**Table 1.** Overview of Main Quality-Related Outcomes and Effects

| Study | Main outcome | Intervention description | Results |
|---|---|---|---|
| **Favorable outcome of the intervention** | | | |
| [21] | Number of MDs | Telepharmacy MH program as a centralized, remote call center model for multiple emergency departments | The rate of unintentional MDs per medication was significantly lower for pharmacy technicians working remotely (8.6%) than for clinicians (14.8%; $P < 0.0001$). |
| [22] | Proportion of patients with at least one MD | Implementation of a software-based checklist in the electronic prescribing system | Before the intervention, 69.9% of patients had at least one MD, compared to 29.6% of patients after the intervention ($P < 0.0001$). |
| [26] | Mean medication error scores | Electronic MH checklist integrated in the EHR system | Medication error scores for MHs obtained using the electronic medication checklist were significantly lower than for those obtained using paper-based documentation ($P < 0.001$). |
| [38] | Number and frequency of accurate MHs | Best possible MH taken by a pharmacy technician | The MH was accurate 38% of the time with the standard process and 70% of the time with the pharmacy technician process ($P < 0.001$). |
| [41] | Percentage of patients with an accurate MH | MHs taken by a trained pharmacy technician | MHs taken by pharmacy technicians were accurate 88% of the time whereas those taken by nurses were accurate 57% of the time ($P < 0.0001$). |
| [59] | Discrepancy rate | First MH by a unit nurse, second MH by a certified pharmacy technician or a research pharmacist | The MD rate per medication was significantly higher for nurses (0.59) than for pharmacy technicians (0.36; $P < 0.001$). |
| [57] | Error score differences | (1) MH obtained and reconciled by a pharmacist in addition to usual care | Patients in the usual care arm had a higher mean (SD) error score of 23.0 (16.1) than those in the pharmacist (4.1 [6.8]) and pharmacy technician (4.1 [7.0]) arms ($P < 0.0001$). |
| | | (2) MH obtained and reconciled by a supervised pharmacy technician in addition to usual care | |
| [61] | Accuracy of preadmission medications listed | MH taken by a pharmacy technician as part of medication reconciliation | Medication accuracy increased from 45.8% to 95% per patient ($P < 0.001$). |
| [64] | Proportion of MDs | MH taken by a pharmacy technician in a preoperative screening clinic via patient interview and verification/reconciliation with external sources | The proportion of patients with one or more MDs was significantly reduced in the postintervention group (38 [18.6%] vs 5 [5.4%]; RR, 0.29; 95% CI, 0.12-0.71). |
| [68] | Number of drug omissions | MH taken by a physician using the "limited questions" list | In the intervention group, a relative reduction of 49.3% in the number of omitted drugs was observed ($P < 0.001$). |
| **No effect of the intervention** | | | |
| [72] | Proportion of patients with at least one MD | Nonmandatory teaching lessons on MH taking for physicians and nurses and implementation of a checklist | There was no significant difference in the proportion of patients with at least one MD after implementation of the checklist and nonmandatory teaching lessons (68.9%) vs before (76.8%; $P = 0.36$). |

Abbreviations: CI, confidence interval; EHR, electronic health record; MD, medication discrepancy; MH, medication history; RR, relative risk.

their level of training for the task); (3) the tools used during the process; (4) the types of preparations included (eg, prescription medications only, dietary supplements); (5) the point in time of medication history taking during the patient journey; (6) the documentation; and (7) additional or optional steps such as means of quality control. With these details being reported, comparisons between a new process and standard care would become more meaningful and facilitate the identification of key factors and crucial steps that influence the effectiveness of an intervention. Concurrently, this would also allow a comparison of the standard of care with other settings, as

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such baseline differences can be large between different institutions and countries. Beyond this, information on the patient population of the study site could be useful to enable more differentiated analyses for specific patient subgroups. Besides age, sex, and medical conditions, reporting on admission mode, complexity of drug therapy, or health literacy might be useful.

Second, standardized terminology, definitions, and measurements of outcomes for quality, process, and potential clinical outcomes are necessary to enable comparisons across different settings and generate transferable evidence. The definition of a core outcome set for medication history studies could be helpful to provide guidance, which would allow more elaborate analyses and explanations for the findings of a study. To facilitate comparisons on an outcome level, a consensus in the definition of MDs, the most frequently used outcome, should be obtained. MDs should include all types of errors, ie, omissions, commissions, and incorrect doses, frequencies, application forms, and strengths. Analyzing their incidence on a medication level would be useful under certain circumstances; however, we believe that they are more meaningful when looked at on a patient level, especially in regard to clinical impact. Further, it always has to be clarified which types of medications were included in analyses (prescription, nonprescription, medicinal products, herbal medicines, others). The type of sources used can be a helpful extension for further analyses regarding the availability and liability of the information gathered and should also be reported, if possible.

Study designs that use MDs traditionally rely on multiple medication histories being taken for the same patient, such as the "best possible medication history" as a gold-standard comparator. Even though this might be the most accurate way to determine medication history quality, these study designs cause additional burden for patients and create higher workloads for research staff, rendering them more resource intensive. Studies conducted in a real-world setting are likely to disrupt other procedures taking place upon patient admission. To facilitate and accelerate future research, alternative study designs that require fewer resources and can easily be integrated into existing processes should be considered.

Future research should also seek to compare different approaches within the same hospital unit or patient population to provide evidence of superiority in a particular clinical setting, for it cannot be assumed that a process that is successful in one setting will have a similar impact in another without adjustments. Evaluating medication history taking in more complex interventions with regard to clinical outcomes can contribute to determining the role and importance of medication history taking within the medication process. Additionally, assessing which information in a medication history is in fact clinically important for patients might be a useful extension of future research, as this can provide further guidance on how to design an efficient process that focuses on gathering only relevant information.

**Limitations.** Because of the observed heterogeneity in methods and outcomes and the frequent lack of statistical evaluation, a meta-analysis was not conducted. However, we have sought to assess the performance of different approaches at different levels where possible and appropriate, and we have sought to identify relevant research gaps. It is possible that studies on certain medication history approaches, especially those that were considered unsuccessful or showed unfavorable results, have never been published (publication bias). This could explain the low number of studies with a negative effect in our review. A bias assessment was not considered feasible due to the different types of studies included, as it would have required different assessment tools and would therefore have limited comparability. Thus, our quality assessment was conducted without a validated instrument. However, we established basic criteria (described in eAppendix E) to ensure a systematic approach. Most of the included studies were conducted in North America (63%), which limits generalizability due to differences in health systems and access to medication data in different countries. Our review focused on hospital admission and excluded inpatient transitions and primary care, where medication history taking is also practiced and assessed. However, we believe that the hospital setting differs significantly from these other settings, such that the transferability of results would be limited. In most studies, the standard care process was the comparator to the new approaches. Although this is comprehensible with regard to study expenses and feasibility, it reduces the ability to generate evidence in terms of the performance of different procedures, especially in comparison to each other. Additionally, the standard care process of medication history taking was described sparsely or not at all in many studies, which further limits the transferability of these results. With the introduction of digital infrastructure and data exchange over the last decades, results and implications from older publications might not be applicable to current settings. Finally, it remains unclear whether and how the quality of medication histories impacts patient outcomes, although it is likely to influence medication safety, as previous research on the relevance of MDs has shown.

## Conclusion

To ensure the quality of the medication history on admission to the hospital, most of the interventions that have been successful so far have used dedicated staff, mainly pharmacy staff. The potential contributions of less expensive resources such as software support or patient engagement have not been well explored. In addition, previous approaches have been heterogenous and are difficult to compare. Therefore, standard endpoints should be defined

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and consistently used in such analyses. Finally, greater efforts should be made to compare and test the superiority of different strategies in the same setting.

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## Disclosures

The authors have declared no potential conflicts of interest.

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